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R E M A R K S

The Office Action issued November 30, 2007 has been received and its contents have been carefully considered.

The applicant herein wishes to thank the Examiner in charge of this application, James W. Rogers, Ph.D., for the courtesy and cooperation he extended to applicant during the personal interview kindly granted on January 3, 2008.

Claims 1, 16 and 21, as currently revised, incorporate the Examiner's suggestions at the interview, as stated in the interview summary, clearly defining the main chain of the graft copolymer as hydrophilic and the side (graft) chain as hydrophobic polystyrene.

Paragraph [0021] of the '625 application, which defines the main chain and the polymeric side (graft) chain of the graft copolymer, is consistent with this revision.

Additional support for this part of the claim can also be found in column 4, lines 21-37, of the '243 Shah patent,

which has been incorporated by reference in the present patent application:

*"The graft copolymer suitable for use in this invention has a hydrophilic polymeric main chain and a hydrophobic polymeric side chain (FIG. 1). The main chain is comprised of monomeric units having acidic groups and optionally neutral monomeric units. The preferred hydrophobic side chain moiety is polystyrene. The graft copolymer is prepared by free radical initiated polymerization of a polystyrene macromonomer having an ethylenically, unsaturated functional group (FIG. 2) with the acidic and neutral hydrophilic comonomers. The acidic comonomers suitable for preparation of the graft copolymer include acrylic acid, methacrylic acid, itaconic acid, 2-acrylamido-2-methyl-propane sulfonic acid, and 2-sulfoethyl methacrylate. The neutral comonomers of the main chain may include acrylamide, methacrylamide, 2-hydroxyethyl methacrylate, N,N-dimethylacrylamide, polyethylene glycol monomethacrylate, and glyceryl methacrylate."*

The revised claims also specify that the main chain can contain neutral hydrophilic monomers in addition to the hydrophilic acidic monomers. The above paragraph also provides support for this part of the claim.

The proportions of the three types of monomers constituting the main chain of the graft copolymer in the revised claim are consistent with those described in the '243 patent column 4, lines 56-65, as shown below:

*"The relative proportions of the three types of monomers may vary within certain limits. The proportion of polystyrene macromonomer may vary from about 1 to about 20 percent by weight, optionally from 1 to 10 percent by weight, and preferably, from 1 to 5 percent by weight, based on the total weight of the copolymer. The ethylenically unsaturated monomer containing acidic groups may vary from 10 to 90 percent by weight of the copolymer. Finally, the neutral hydrophilic monomer may vary from 0 to 89 percent by weight of the copolymer."*

Example 1 of the present application concerns the preparation of a graft copolymer by copolymerization of

polystyrene macromonomer, acrylic acid (hydrophilic acidic monomer), and N,N-dimethylacrylamide (hydrophilic neutral monomer). During the interview, the applicant demonstrated to the Examiner as evidence the CAS #, trademark name (PharmaDur<sup>®</sup>), and nomenclature of structure of the same copolymer composition, which has been commercialized by the inventor. Thus, in the present application itself there is description of the "best mode" of practicing the invention.

RESPONSE TO PAGES 2, 3 AND 4 OF THE OFFICE ACTION

In recognition of the Examiner's comments in the Office Action regarding the two mutually exclusive terms "stable gel" and "stable dispersion", the term "gel" is deleted from the previous phrase. The revised claims 1 and 16 now recite a homogeneous, stable, dispersion of the specified graft copolymer in a water based carrier. The term "gel" is appropriately combined with the Markush group for the carriers. This change more correctly describes the invention and eliminates the inconsistency referred to by the Examiner.

The term "carrier", as extensively used in trade and industry for skincare or dermatological products for

treatment of skin, refers to a composition in which an "active agent" (e.g. drug substance or ACTIVE PHARMACEUTICAL INGREDIENT, cosmetic active ingredient such as anti-aging compound) is incorporated to produce a suitable product formulation. Thus, the term carrier is not restricted to only solvents (water, organic solvents, etc) but encompasses liquid or semi-solid formulations in the form of gel, emulsion, suspension, solution, cream, lotion, petrolatum or wax-based preparations. The carrier is a means for uniformly applying an active agent to skin.

It is in this industry context that the term carrier is used in the claims of the present invention. In the present invention, "carrier" is a means for uniformly applying the graft copolymer to skin in the form of a film. The applicant demonstrated to the Examiner, during the January 3 interview, examples of commercial and laboratory formulations of a representative copolymer (PharmaDur® Polymer; copolymer of N,N-dimethylacrylamide, acrylic acid, and polystyrene macromonomer) in the form of gel, emulsion, suspension, solution, and petrolatum-based ointment carriers. It was demonstrated that even the petrolatum based carrier can contain water, in which the graft copolymer of this invention can be dispersed. This

demonstration was intended to communicate that preparation of formulations in such carriers is a very common practice in the cosmetic and dermatological products industry.

Preparation of dosage forms in the specified carriers for skin treatment are described in paragraph [0024] of the present application. Formation of gel and details of its properties are also described in this paragraph, which further characterizes the graft copolymer gel as not being a true thermodynamic solution. Bluish haze in the copolymer gel indicates that it is dispersion with microscopic or submicroscopic particles of polymer dispersed in water. Combining such an aqueous phase with an oil phase to form an emulsion with the aid of surfactants and homogenizing action is very well known in the field and extensively practiced technique, which needs no further elaboration. The stated Examples in this patent application describe in detail the preparation of gel (Example 8) and an emulsion as a cream (Example 2).

RESPONSE TO PAGES 5 AND 6 OF THE OFFICE ACTION

The Examiner's summary of the January 3 interview and the November 30 office action stress the rejection of the

claims based on obviousness (U.S.C. 103 (a)) over Morrissey alone and/or in combination with the '243 patent.

In accordance with Examiner's suggestion during the interview, the independent claims have been revised to show that the hydrophilic acidic and optionally hydrophilic neutral monomers are part of the main chain and the styrene macromolecules comprise the graft portion of the copolymer. This amendment is supported by the specifications of both the present application and the '243 patent, incorporated therein.

The revised claims are substantially differentiated from the Morrissey patent disclosures in that the main chain of the graft copolymers of the present invention is hydrophilic and the polymeric side chain is hydrophobic, which is exactly opposite of the Morrissey copolymers. The patent to Morrissey unambiguously defines the side chains being hydrophilic. See, for example:

**Abstract - Title page:**

"Disclosed are cosmetic compositions comprising: (a) from about 0.1% to about 50%, based on the weight of the composition, of a film-forming graft copolymer, wherein the copolymer comprises: (i) a backbone exhibiting a T<sub>sub</sub>.g of from about 0.degree. C. to about 50.degree. C.; and (ii) one or more hydrophilic grafts attached to the backbone...".

**Summary of the Invention - Column 1:**

*"The present invention relates to cosmetic compositions having improved wear, preferably comprising:*

(a) from about 0.1% to about 50%, based on the weight of the composition, of a film-forming graft copolymer, wherein the copolymer comprises:

(i) a backbone exhibiting a  $T_{sub}g$  of from about 0.degree. C. to about 50.degree. C.; and

(ii) one or more hydrophilic grafts attached to the backbone wherein each of the grafts exhibits a  $T_{sub}g$  of from about 50.degree. C. to about 200.degree. C., and ..."

**Column 3, lines 50-56:**

"The graft copolymers of the present invention exhibit one or more glass transition temperatures ( $T_{sub}g$ ). Preferred copolymers have at least two distinct immiscible phases, wherein the essential, hydrophilic polymeric side chains are closely associated with each other and exist in one phase and the polymeric backbone of the copolymer remains in a second separate phase. As a consequence of this phase immiscibility, the copolymer may exhibit at least two distinct  $T_g$  values, namely one  $T_{sub}g$  value for the backbone and one  $T_{sub}g$  value for the side chains, if the temperature separation between each of the  $T_{sub}g$  values involved is large enough."

**Column 5, section (b) :**

**"b) Hydrophilic Grafts (Side Chains) of the Graft Copolymer**

The copolymers of the present invention comprise from about 2% to about 50%, preferably from about 5% to about 40%, and more preferably from about 10% to about 30%, by weight of the graft copolymer, of hydrophilic side chains. Typically, the weight average molecular weight of the side chains is from about 1000 to about 50,000. The exhibit a  $T_{sub}g$  of from about 50.degree. C. to about hydrophilic side chains 200.degree. C., preferably from about 60.degree. C. to about 150.degree. C., and most preferably from about 70.degree. C. to about 110.degree. C."

**In contrast, the hydrophobic polystyrene graft side chains are essential and critical to the compositions of the present invention for the required properties, e.g. water insolubility and cohesive strength. The combination of the specified hydrophilic main chain and hydrophobic graft chains result in the desired properties (hydrogel formation, water insolubility, cohesive strength and bioadhesion to skin) of the graft copolymers.**

Morrissey has defined the graft side chains as hydrophilic as formed by polymerizing a range of hydrophilic monomer(s) or its mixture with hydrophobic monomer(s). Morrissey does not describe the side chain polymeric graft as being hydrophobic anywhere in the specification. Indeed, Morrissey has described the hydrophilic grafted side chains as being "essential" (see above in column 3) to produce a copolymer having the required properties of the compositions of his invention.

Although the specification of the Morrissey patent does not so specify, it would be apparent to those skilled in the art that the backbone polymer would have to be hydrophobic to be able to retain the hardness, rigidity and toughness required for longer durability under the normal environmental use conditions described therein. It is well recognized by those skilled in the art that a graft copolymer with a hydrophilic backbone and hydrophilic side chains would not be expected to produce the wear and environmental stress resistant compositions disclosed by Morrissey. In fact, all the exemplary graft copolymers described in columns 7 and 8 have hydrophobic backbones.

The backbone or main chains of the present invention are hydrophilic by definition. These graft copolymers form

hydrogels in an aqueous environment. No such hydrogel formation is disclosed by Morrissey.

In summary, the graft copolymers of Morrissey and the present invention are both structurally and chemically very different entities. It is well known that different polymers behave differently. Therefore, the claims of the present invention cannot be considered obvious from the Morrissey patent disclosures.

The claims of the present invention are also significantly differentiated from the '243 patent in that formation of homogenous stable dispersion in water is not obvious from '243. As per the Examiner's Interview Summary for the January 3 interview, it was shown by demonstration of prototype samples that homogenization of an exemplary hydrogel (Tecogel by Noveon) did not produce a homogenous dispersion. This property is characteristic of polymeric hydrogels. Therefore, it would not be obvious to expect that the graft copolymer hydrogels of the '243 patent would produce homogenous and stable dispersions in water or water based carriers.

The Examiner has referred (on page 6 of the November 30 Office Action) to Morrissey's disclosure "that it was

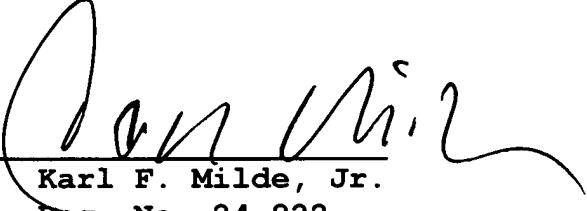
already well known and understood in the art that compositions comprised of graft copolymers within the scope of applicant's claimed invention could form single phase dispersions in water." The applicant would like to point out, respectfully, that hydrogels [defined in polymer chemistry as water-insoluble but water-swellable (typical water content > ~ 25 % by weight) polymers] do not form single phase dispersions in water. This fact is clearly demonstrated by the example of Tecogel referred to above. Further, the present application has described the homogenized graft copolymer composition in water as not being a thermodynamic solution (single phase; molecularly homogeneous) but, rather, a dispersion in water with a bluish haze. The bluish haze is indicative of light scattering by microscopic or submicroscopic dispersed particles of the graft copolymer in water. Thus, the claimed composition actually has two phases - dispersed copolymer particulate phase and the continuous aqueous phase. This behavior of the graft copolymers recited in claims 1 and 16 further differentiates them from those of Morrissey.

Consequently, the claimed compositions are neither obvious over, nor anticipated from, either Morrissey or Shah '243, taken either alone or in combination with each other.

In conclusion, it is believed that the independent claims 1, 16 and 21, as amended, are supported by the specification, are clear and definite, and distinguish patentably over the cited prior art.

This application is therefore believed to be in condition for immediate allowance. A formal Notice of Allowance is accordingly respectfully solicited.

Respectfully submitted,

By   
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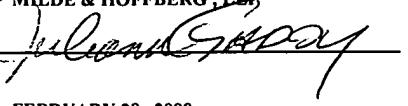
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JANUARY 24, 2008

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By 

Date FEBRUARY 28, 2008